

Evolution of the Cantabrian Mountains maritime glaciers during Heinrich Stadial 1 / Oldest Dryas and coupled response with thermohaline circulation in the North Atlantic Region

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Ice sheet melting and collapse during the Last Glacial Termination or Termination-I triggered important changes in thermohaline circulation which caused changes in atmospheric circulation and seasonality. The comparisons made between marine and terrestrial records in the Northern Hemisphere suggest synchronous but heterogeneous responses of both environments in Southern Europe during Heinrich Stadial 1/Oldest Dryas (HS1/OD). Focusing on the Iberian Margin, which is under the direct influence of the North Atlantic Drift current, vegetation variations recorded in core MD03-2697 indicate that HS1/OD is a complex climate event with three distinctive phases: extremely cold/relatively wet (HS1-a), cool/dry (HS1-b), and relatively warmer/increasing precipitation (HS1-c) (Naughton et al., 2016).

Here we focus on reconstructing the evolution of maritime mountain glaciers in the Cantabrian Mountains of Northern Spain (43°N). This deglaciated mountain chain reaches elevations of up to 2648 m a.s.l. running parallel to the Cantabrian Coastline, westward of the Pyrenees and all along the northern margin of the Iberian Peninsula. Its short distance to the North Atlantic Ocean, less than 100 km, makes it ideal to study the coupled response between marine and terrestrial archives during the latest Heinrich Events (HS1 and HS0).

Our previous studies based on ^{10}Be surface exposure dating of 20 boulders from moraines and rock glaciers in the Monasterio valley revealed progressive recession and thinning of glaciers between 18.1 ka (glacier front at 1150 m) and 16.7 ka (glacier front at 1170 m), during HS1a and HS1-b (Rodríguez-Rodríguez et al., 2017). The last stagnation of the glacier front ended at a minimum age of 14 ka (marked by a cirque moraine located at 1540 m), during the Oldest Dryas (OD). The stagnation age obtained at the foot of a rock glacier nested within the OD moraine suggests that the Monasterio valley was fully deglaciated during the Allerød. The Monasterio valley lacks a glacier response to the HS0 event (also known as Younger Dryas) probably due to the modest elevation of the source area (2022 m a.s.l.). Here we provide 64 new ^{10}Be and ^{36}Cl surface exposure ages from

boulders taken from similar landforms sampled in nearby valleys. Landforms selected are distributed at similar (1560 m) to higher elevations (up to 2100 m) than those from the Monasterio valley in order to better reconstruct how glaciers responded to the HS1 and HS0 events in the Cantabrian Mountains, and what the distribution of equilibrium lines was with regards to paleoclimate conditions.

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